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Page 1 of: 33

Attention: MAIL STOP APPEAL BRIEF
Group Art Unit 2611
Examiner Qutbuddin Ghulamali

From: SMART & BIGGAR

Your file no.: 10/038,916

Date: July 11, 2007

Reply to Ottawa file no.: 77682-319/jas

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ENCLOSURES *(Check all that apply)*

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- [ ] Proprietary Information
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- [x] Other Enclosure(s) (please identify below):

1) Amended Appeal Brief in response to Non-Compliant Appeal Brief issued on June 12, 2007

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Smart & Biggar		
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Printed name	R. Allan Brett		
Date	July 11, 2007	Reg. No.	40,476

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	10/038,916
Applicant	:	Ming Jia, et al
Filed	:	January 8, 2002
TC/A.U.	:	2611
Examiner	:	Qutbuddin Ghulamali
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Dear Sir:

APPEAL BRIEF UNDER 37 C.F.R. 41.37

The following is the Appellant's Brief, submitted under the provisions of 37 C.F.R. 41.37. The fee of $500 that is required by 37 C.F.R. 41.20(b)(2) for filing a brief in support of the appeal was provided upon the first submission of the Appeal Brief on May 8, 2007. This amended version of the Appeal Brief is filed in response to the Notice of Non-Compliant Appeal Brief issued June 12, 2007.

Real Party in Interest

The real party in interest is the assignee of record, i.e. Nortel Networks Limited, current address 2351 Boulevard Alfred-Nobel, St. Laurent, Quebec, Canada, H4S 2A9.

Related Appeals and Interferences

There are no related appeals or interferences that will directly affect, be directly affected by, or have a bearing on the present appeal.

Status of Claims

Claims 1-16, 18-32, 34-38, 40 and 41 are currently pending in the application. Claims 17, 33 and 39 have been cancelled.

The status of the claims based on the Final Office Action issued on November 16, 2006 is as follows:

Claims 1-16, 36, 40 and 41 are rejected for reasons identified below in the "Grounds of Rejection to be Reviewed on Appeal" section.

Claims 18-32, 34, 35 and 38 are allowed.

Claim 37 is objected to, but allowable if minor amendments are made to the claim to overcome objections identified on page 3 of the final Office Action and if rewritten in independent form, including the limitations of base claim 36.

The claims being appealed are claims 1-16, 36, 37, 40 and 41.

Status of Amendments

A response to the final Office Action was filed on January 16, 2007, in which claims 4 and 7 were amended. A further limitation was added to both claims which recited "feeding back the channel quality indicator back to a transmitter for use in determining and applying an appropriate coding rate and modulation to the source data element sequence". Similar limitations are included in independent claims 11 and 14 and were added to independent claim 1 in the Office Action response filed August 23, 2006. This amendment was made in an effort to make claims 4 and 7 consistent with independent claims 1, 11 and 14 in the interest of simplifying issues for appeal. If the Board finds that any of claims 1, 11 and 14 should not have been rejected by the Examiner, and reopens prosecution of these claims, Applicant submits that prosecution should be reopened for claims 4 and 7 as well, so that the above-identified limitation could be added to the claims and entered for further prosecution.

Claim 37 was also amended in response to the final Office Action to recite "based on the scattered pilot pattern to extract the ~~combined~~ pilot symbols", where the underlined text is added

to the claim and the strikethrough text has been deleted from the claim. Applicant submits that these amendments address the objections raised by the Examiner on page 3 of the Final Office Action. Claim 37 was not rewritten in independent form, because for reasons discussed below, it is believed that claim 36 is allowable.

An Advisory Action issued on February 12, 2007. The Examiner was still not persuaded that claims 1-16, 36, 40 and 41 are novel and/or patentably distinguish over the combination of cited references. None of the amendments to claims 4, 7 and 37 were entered as indicated in paragraph 7 of the Advisory Action.

In preparing this Appeal Brief Applicant discovered that claim 38 is currently dependent upon claim 35. As claim 38 is a method claim, and claim 35 is an article of manufacture claim, Applicant submits that claim 38 should in fact be dependent upon claim 36. If the Board finds that claim 36 should not have been rejected by the Examiner, and reopens prosecution of this claim, Applicant submits that the dependency of claim 38 will be amended appropriately.

Summary of Claimed Subject Matter

The invention as recited in independent claim 1 relates to "A channel quality measurement apparatus adapted to measure a quality of a channel over which has been transmitted a sequence of symbols produced by encoding and constellation mapping a source data element sequence". An example of a channel quality apparatus adapted to measure a quality of a channel over which has been transmitted a sequence of symbols produced by encoding and constellation mapping a source data element sequence is illustrated as reference character 230 in Figure 2. An example of such an apparatus is described in detail starting at page 18, line 25.

In claim 1, the apparatus is recited to include "a symbol de-mapper, receiving as input a sequence of received symbols over the channel whose quality is to be measured, said symbol de-mapper being adapted to perform symbol de-mapping on said sequence of received symbols to produce a sequence of soft data element decisions". An example of such a de-mapper is described with respect to Figure 2 at page 18, line 29 to page 19, line 3. In Figure 2, the de-mapper is identified by reference character 236.

In claim 1, the transmitter is recited to also include "a soft decoder, receiving as input the sequence of soft data element decisions produced by the symbol de-mapper, said soft decoder being adapted to decode the sequence of soft data element decisions to produce a decoded output sequence". An example of a soft decoder is described with respect to Figure 2 at page 19, lines 3-7. In Figure 2, the soft decoder is identified by reference character 238.

In claim 1, the transmitter is recited to also include "an encoder, receiving as input the decoded output sequence produced by the soft decoder, said encoder being adapted to re-encode the decoded output sequence with an identical code to a code used in encoding the source data element sequence to produce a re-encoded output sequence". An example of an encoder is described with respect to Figure 2 at page 19, lines 7-9 and lines 12-16. In Figure 2, the encoder is identified by reference character 240.

In claim 1 it is further recited that "a correlator, receiving as input the sequence of soft data element decisions produced by the symbol de-mapper, and the re-encoded output sequence produced by the encoder, said correlator being adapted to produce a channel quality indicator output by determining a correlation between the sequence of soft data element decisions and the re-encoded output sequence". An example of a correlator is described with respect to Figure 2 at page 19, lines 13-16 and lines 20-32. In Figure 2, the correlator is identified by reference character 250.

In claim 1 it is further recited that "wherein the apparatus is adapted to feed the channel quality indicator back to a transmitter for use in determining and applying an appropriate coding rate and modulation to the source data element sequence". The limitation of feeding back the quality indicator back to the transmitter is described for example at page 24, lines 15-20.

The invention as recited in independent claim 4 relates to "A method of measuring channel quality of a channel over which has been transmitted a sequence of symbols produced by encoding and constellation mapping a source data element sequence". The method described in claim 4 substantially corresponds to functionality performed by the elements of the apparatus of claim 1, which is described starting at page 18, line 25.

The method of claim 4 recites a step of "receiving a sequence of received symbols over the channel whose quality is to be measured". As claim 4 is a method of measuring channel quality of a channel over which has been transmitted a sequence of symbols, claim 4 is a method performed at the receiving end of the transmission. Therefore a first step of the method is receiving the symbols over the channel. For example, the receiver front-end 234 in Figure 2 is an example of an element that may perform the receiving, together with antenna 232, as described at page 18, lines 25-29.

The method of claim 4 recites a further step of "symbol de-mapping said sequence of received symbols to produce a sequence of soft data element decisions". This method step corresponds to a function performed by the symbol de-mapper 236 of the mobile station 230 in Figure 2, which is described at page 18, line 29 to page 19, line 3.

The method of claim 4 recites a further step of "decoding said sequence of soft data element decisions to produce a decoded output sequence". This method step corresponds to a function performed by the soft decoder 238 of the mobile station 230 in Figure 2, which is described at page 19, lines 3-7.

The method of claim 4 recites a further step of "re-encoding said decoded output sequence to produce a re-encoded output sequence using a code identical to a code used in encoding the source data element sequence". This method step corresponds to a function performed by the encoder 240 of the mobile station 230 in Figure 2, which is described at page 19, lines 13-17.

The method of claim 4 recites a further step of "correlating said re-encoded output sequence, and said sequence of soft data element decisions to produce a channel quality indicator output". This method step corresponds to a function performed by the correlator 250 of the mobile station 230 in Figure 2, which is described at page 19, lines 20-32.

Independent method claim 7 is directed to similar subject matter to that of independent method claim 4, with the additional limitation that it is an OFDM channel quality being measured of an OFDM channel over which has been transmitted a sequence of OFDM symbols. An example of an embodiment of the invention being performed for OFDM can be found in the

specification at page 17, lines 16-7, in which it is described that "The preferred embodiment presented is based on an MIMO-OFDM frame structure". Since an OFDM frame structure is used in the preferred embodiment, the embodiment deals with OFDM symbols, channels and channel quality. The steps of symbol demapping, decoding, re-encoding and correlating are described at page 18, line 25 to page 19, line 32, as discussed in detail above with reference to claim 4.

Independent system claim 11 is directed to a system comprising a transmitter and a receiver. An example of such a system is described in the present application from page 17, line 26 to page 19, line 31 with respect to Figure 2. The transmitter of claim 11 is recited to be "a transmitter adapted to transmit a sequence of symbols produced by encoding and constellation mapping a source data element sequence over a channel". An example of such a transmitter is described at page 17, lines 26 to page 18, line 17 and is identified in particular by reference character 210. Reference characters 200 and 220 are examples of additional transmitters in Figure 2. The claim recites a receiver comprising a collection of elements similar to the elements of independent apparatus claim 1. Examples of these elements a symbol de-mapper, a soft decoder, an encoder, and a correlator are described at page 18, line 25 to page 19, line 32. As described above, an example of the receiver is identified as reference character 230.

Independent method claim 14 is directed to "A method of adaptive modulation and coding". The method is for adaptive modulation and coding since information received at the receiver is fed back to the transmitter to adaptively influence the modulation and coding of the transmitter (page 5, lines19-21 and page 24, lines14-15). The method includes a first step of "transmitting over a channel a sequence of symbols produced by encoding and constellation mapping a source data element sequence". This is described in the present application, for example, at page 18, lines 12-14. The steps of "receiving a sequence of received symbols over the channel; symbol de-mapping said sequence of received symbols to produce a sequence of soft data element decisions; decoding said sequence of soft data element decisions to produce a decoded output sequence; re-encoding said decoded output sequence to produce a re-encoded output sequence using a code identical to a code used in encoding the source data element sequence; correlating said re-encoded output sequence, and said sequence of soft data element decisions to produce a channel quality indicator output" are substantially the same steps as

recited in independent claims 4 and 7 and as such are described at page 18, line 25 to page 19, line 32.

A further step of the method includes "transmitting the channel quality indicator". An example of this step is described at page 24, lines 15-17.

Another step of the method is "using said channel quality indicator to determine and apply an appropriate coding rate and modulation to the source data element sequence". An example of this step is described at page 24, lines 17-20.

Independent claim 36 is directed to "A method of generating pilot symbols from an Orthogonal Frequency Division Multiplexing (OFDM) frame received at an OFDM receiver, the OFDM frame containing an encoded fast signalling message in the form of encoded symbols within the OFDM frame". Generating pilot symbols from an Orthogonal Frequency Division Multiplexing (OFDM) frame received at an OFDM receiver, the OFDM frame containing an encoded fast signalling message in the form of encoded symbols within the OFDM frame is described in the present application at page 25, lines 23-27.

Claim 36 further recites the step of "processing the encoded symbols based in a scattered pilot pattern to recover the encoded fast signalling message". The step of "processing the encoded symbols" may include, for example, one or more of steps one to four as described at page 25, line 28 to page 26, line 9.

Claim 36 further recites the step of "re-encoding the fast signalling message so as to generate pilot symbols in the scattered pattern". The step of "re-encoding the fast signalling" may include, for example, one or both of steps five and six as described at page 26, lines 9-12.

Claim 36 further recites the step of "recovering a channel response for the encoded symbols using decision feedback". The step of "recovering a channel response for the encoded symbols" may include, for example, one or both of steps seven and eight as described at page 26, lines 16-19. An example of the expression "decision feedback" is located at page 37, lines 11-15. Specifically, this example refers to the function of re-encoding the decoded data after the transmit parameter signalling symbols have been decoded.

Independent claim 40 is directed to "A transmitter adapted to combine pilot and transmission parameter signalling on a single overhead channel within an OFDM signal". Combining pilot and transmission parameter signal on an overhead channel within an OFDM signal is described in the present application at page 25, line 23 to page 26, line 15.

Claim 40 further recites "wherein a set of transmission parameter signalling symbols are transmitted on the overhead channel with strong encoding such that at a receiver, they can be decoded accurately, re-encoded, and the re-encoded symbols treated as known pilot symbols which can then be used for channel estimation". The functionality of decoding and re-encoding in particular, substantially corresponds to similar functionality of decoding and re-encoding recited in claims 1 and 4 and discussed in detail above with reference to claims 1 and 4. The re-encoded symbols being treated as known pilot symbols used for channel estimation is described for example at page 37, line 9 to page 38, line 6.

Grounds of Rejection to be Reviewed on Appeal

The issues which are hereby presented for review are as follows:

1. whether claims 1 and 11 are unpatentable under 35 U.S.C. 103(a) over ten Brink (US Patent 6,611,513) in view of Stein (USP 6,175,590) and further in view of Balachandran et al (USP 6,215,827, hereinafter Balachandran);

2. whether claims 2, 3, 12 and 13 are unpatentable under 35 U.S.C. 103(a) over ten Brink in view of Stein and Balachandran and further in view of Jones et al (USP 6,215,813, hereinafter Jones);

3. whether claims 4, 7, 14 and 36 are unpatentable under 35 U.S.C. 103(a) over ten Brink in view of Stein;

4. whether claims 5, 6, 15 and 16 are unpatentable under 35 U.S.C. 103(a) over ten Brink in view of Stein and further in view of Jones;

5. whether claims 8 to 10 are unpatentable under 35 U.S.C. 103(a) over ten Brink in view of Stein and further in view of Thomas et al (United States Patent Publication No. 2002/0051498, hereinafter Thomas);

information based on the channel quality to be used in determining and applying an appropriate coding rate and modulation. There is no suggestion or disclosure that the quality indicator described by Stein to assist in making the determination of the received data rate is a channel quality indicator, in particular a channel quality indicator to be fedback to the transmitter to be used in determining and applying an appropriate coding rate and modulation. The quality indicator disclosed in Stein at column 9, lines 45-61 is a Yamamoto quality metric, which is described as a confidence metric "based on the difference between the selected path through a trellis and the next closest path through the trellis. Therefore, the Yamamoto quality metrics are good indications of the degree of confidence that the decoded symbols are indeed the correct symbols". Applicant submits that such a metric may or may not be dependent upon the channel quality. There is no guarantee of a one to one relationship between a channel quality indicator as described in the present application and the quality indicator disclosed in Stein.

Stein teaches the use of a set of correlation results, one per data rate, to determine the most likely rate at which data was sent. <u>There is no suggestion anywhere in Stein that this is in any way indicative of the quality of the signal.</u> The "best correlation" may in fact still pertain to a signal with very poor quality. In fact, the reference teaches away from the use of the correlation result as a quality metric. Having decided which rate was used, the receiver does not decide to keep or discard the result on the basis of any "quality" associated with the correlation result. Rather, other metrics, such as CRC and Yamamoto are used to determine the quality of the result, and to decide whether to keep or discard the result.

More specifically, referring to Column 2, lines 59 to 67:

> "In the typical situation, only the data rate corresponding to the highest normalized correlation metric is considered. This frame can be accepted or erased, depending on the CRC check and/or the Yamamoto quality metric. In some applications, CRC encoding may not be performed on all data rates. When this occurs, the Yamamoto quality metric can be used in place of the CRC check, other metrics can be used, or the data rate determination process can be made dependent only on the normalized correlation metrics."

It is respectfully submitted that for at least the above reasons it is clear that the correlations *per se* are not considered quality metrics.

With regard to column 10, lines 30-38, Stein is only describing that any number of data rates and any rate value is within the scope of the invention. There is no further suggestion or disclosure of a channel quality metric.

With regard to column 3, lines 1-16, Stein discloses that "It is an object of the present invention to provide a reliable determination of the received data rate". There is no suggestion that a channel quality indication is being produced that is used for determining the channel quality and which would be useful for determining and applying an appropriate coding rate and modulation to the source data element sequence at the transmitter. Stein is performing a blind rate detection to determine the rate used by the transmitter, there is no suggestion in Stein of changing the coding rate and modulation based on receiver determined information.

The Examiner then proceeds to combine ten Brink and Stein with Balachandran at the bottom of page 5 and the top of page 6 of the Final Office Action. It is alleged that Balachandran discloses transmitting a channel quality indication to a transmitter based on channel quality for use in determining and applying an appropriate coding rate and modulation. However, as described above, Stein does not disclose determining a channel quality metric. Thus, if one were to combine Stein with Balachandran (assuming there would be any motivation for such a combination, which Applicant does not concede), it seems that the person skilled in the art would feed back the Yamamoto metric or CRC disclosed by Stein to the transmitter, since these are both suggested as candidates for quality metrics. As the Yamamoto metric or CRC disclosed by Stein is not a channel quality indication, Applicant submits that it is unclear how the Yamamoto metric or CRC would be used in determining and applying an appropriate coding rate and modulation. Combining Stein with Balachandran does not yield the claimed invention because of the missing step of using the correlation result as a channel quality indication and feeding back the channel quality indicator to the transmitter for use in determining and applying an appropriate coding rate and modulation is not disclosed by the combination of references as claimed.

Motivation to Combine

In the final Office Action, the Examiner states that it would have been obvious to combine ten Brink and Stein with Balachandran because the channel quality determination feedback to the transmitter can allow efficient and accurate rate adjustment of the transmission of the coded communication data signal. As discussed above, Stein does not disclose producing a channel quality indicator. Applicant submits without citing a reference operable to produce a channel quality indicator in a manner that is consistent with embodiments of the present invention, in particular as recited in independent claim 1, there is no motivation to combine a further reference (for example Balachandran) that is alleged to disclose the limitation of transmitting a channel quality indicator to the transmitter for use in determining and applying an appropriate coding rate and modulation.

Furthermore, it is clearly an objective of Stein to minimize overhead. See column 6, lines 47-54 where the reason for not signalling the rate used for transmission, thereby requiring blind rate detection in the receiver, is clearly established as avoiding the requirement of additional overhead bits. Thus, the additional overhead required by the Balachandran approach of feeding back quality metrics would be something to be avoided in the system of Stein.

In addition, to satisfy the motivation to combine, there needs to be established a motivation to combine two or more references <u>in the manner claimed.</u> It is not enough to establish some motivation to combine two references generally, and then start picking individual elements from the two references, as Applicant submits the Examiner is doing in the rejection of claim 1.

Thus, it is respectfully submitted the Examiner has failed to satisfy two of the criteria for establishing a *prima facie* case of obviousness. The first criteria that has not been satisfied is that the references teach all of the limitations. None of the references cited by the Examiner teach the use of correlations computed in the matter claimed for use as a quality metric. Secondly, the Examiner has failed to satisfy the burden of showing motivation to combine. As detailed above, Stein teaches away from using the correlation metric as a quality metric (because Stein suggests using CRC or Yamamoto metrics instead) and further teaches away from sending any quality metric back to the transmitter as evidenced by the efforts made to avoid increasing overhead by requiring blind rate detection.

6. whether claims 40 and 41 are anticipated under 35 U.S.C. 102(e) by Thomas; and

7. whether in claim 37, the expression "the combined pilot symbols" in lines 2 to 3 has insufficient antecedent basis and whether the word "pilot" needs to be inserted after the expression "based on the scattered" in line 2.

Argument

1. Whether claims 1 and 11 are unpatentable under 35 U.S.C. 103(a) over ten Brink in view of Stein and further in view of Balachandran.

The requirements for establishing a *prima facie* case of obviousness as set out in the MPEP Section 2143.01 require that the reference or references when combined teach all of the claimed limitations, that there be a reasonable expectation of success in realizing the claimed invention, and that there be a motivation to combine the references.

In paragraph 9 of the Final Action issued November 16, 2006, the Examiner has rejected claims 1 and 11 under 35 U.S.C. 103(a) as being unpatentable over ten Brink in view of Stein and further in view of Balachandran.

Applicant respectfully submits that it is not clear what the relevance of the ten Brink reference is. The reference relates to iterative de-mapping of a received signal. There is no re-encoding of a decoded output sequence in the matter claimed (conceded by the Examiner on page 4) and there is no feeding back of any channel quality, conceded by the Examiner on page 5 of the Office Action.

<u>Missing Claim Elements</u>

In the Final Office Action dated November 16, 2006 the Examiner alleges on page 2 of the Office Action that Stein discloses the use of a quality indicator in the data rate determining process at column 9, lines 45-61 and column 10, lines 30-38. Furthermore, at page 5 of the Office Action it is alleged that Stein discloses a correlator being adapted to produce a channel quality indicator at column 3, lines 1-16.

With regard to column 9, lines 45-61, Stein discloses using a quality indicator to assist in making the determination of the received data rate. Stein discloses a blind rate detection method to determine the coding rate used by the transmitter, not to aid in providing the transmitter

On this basis it is considered that the Examiner has erred in rejecting claim 1 under 35 U.S.C. 103(a).

Independent claim 11 is a claim that recites a system comprising a transmitter and a receiver that comprises the elements of the apparatus of claim 1. For at least the same reasons described above with regard to claim 1, Applicant submits that claim 11 patentably distinguishes over the combination of references.

On this basis it is considered that the Examiner has erred in rejecting claim 11 under 35 U.S.C. 103(a).

2. Whether claims 2, 3, 12 and 13 are unpatentable under 35 U.S.C. 103(a) over ten Brink in view of Stein and Balachandran and further in view of Jones.

In paragraph 10, the Examiner has rejected claims 2, 3, 12 and 13 on the basis of the same references as in claims 1 and 11, and further in view of Jones.

Claims 2 and 3 depend on claim 1 and claims 12 and 13 depend on claim 11. Applicant submits that Jones does not teach the missing limitations of claims 1 and 11 discussed above. For at least the reason of their dependence upon claims 1 and 11, Applicant respectfully submits that claims 2, 3, 12 and 13 should be patentable for at least for the same reasons discussed above pertaining to claims 1 and 11.

On this basis it is considered that the Examiner has erred in rejecting claims 2, 3, 12 and 13 under 35 U.S.C. 103(a).

3. Whether claims 4, 7, 14 and 36 are unpatentable under 35 U.S.C. 103(a) over ten Brink in view of Stein.

In paragraph 12, the Examiner has rejected independent claims 4, 7, 14 and 36 under 35 U.S.C. 103(a) as being unpatentable over ten Brink in view of Stein.

As described above in the Summary of Claimed Subject Matter section, claims 4 and 7 are substantially similar to one another with regard to their subject matter, except that claim 7 has the additional limitation that the method is for OFDM.

Claims 4 and 7 are similar to the subject matter recited in claims 1, 11 and 14, except that they do not recite the additional limitation of feeding back the channel quality indicator back to a

transmitter for use in determining and applying an appropriate coding rate and modulation to the source data element sequence. As such, the Examiner has combined ten Brink and Stein, but not Balachandran. For the same reasons described above with regard to claim 1, Applicant submits that Stein does not teach the limitation of "correlating said re-encoded output sequence, and said sequence of soft data element decisions to produce a channel quality indicator output". In particular, Stein does not teach producing a channel quality indicator output.

For at least the reason that Stein does not teach all the limitations of the claims, Applicant submits that the Examiner has failed to satisfy the requirements of establishing a *prima facie* case of obviousness, in particular that all the limitations of the claims be taught by the combination of references. On this basis it is considered that the Examiner has erred in rejecting claims 4 and 7 under 35 U.S.C. 103(a).

Claim 14 is similar to claims 4 and 7, except that claim 14 includes an initial step of transmitting a sequence of symbols. Furthermore, claim 14 also includes the steps of "transmitting the channel quality indicator and using said channel quality indicator to determine and apply an appropriate coding rate and modulation to the source data element sequence", which are not recited in claims 4 and 7, but which are recited in claims 1 and 11. Therefore, the arguments presented above pertaining to claims 1 and 11 apply to claim 14.

The Examiner has lumped claims 4 and 36 together on page 7 of the detailed action. However, these claims are completely different and the basis for rejecting claim 36 is not readily apparent to Applicant. Claim 36 was allowed in the Office Action dated June 10, 2005, and referring all the way back to the Office Action dated September 9, 2005, the Examiner has not referred to any of the features in this claim in any of his rejections.

As claim 36 has been previously allowed and there is no reasonable explanation why it is being rejected, Applicant submits that claim 36 is in fact allowable. As such, claim 37 as amended in the response filed January 16, 2007 should be entered and allowed as well.

On the above discussed basis it is considered that the Examiner has erred in rejecting claims 14 and 36 under 35 U.S.C. 103(a).

4. Whether claims 5, 6, 15 and 16 are unpatentable under 35 U.S.C. 103(a) over ten Brink in view of Stein and further in view of Jones.

In paragraph 13 of the detailed action, the Examiner has rejected claims 5, 6, 15 and 16 under 35 U.S.C. 103(a) as being unpatentable over ten Brink in view of Stein and further in view of Jones.

Claims 5 and 6 depend on claim 4 and claims 15 and 16 depend on claim 14. The arguments presented above pertaining to claim 4 apply to claims 5 and 6. The arguments presented above pertaining to claim 1 apply to claims 15 and 16, as claim 14 includes substantially similar subject matter to claim 1.

On this basis it is considered that the Examiner has erred in rejecting claims 5, 6, 15 and 16 under 35 U.S.C. 103(a).

5. Whether claims 8 to 10 are unpatentable under 35 U.S.C. 103(a) over ten Brink in view of Stein and further in view of Thomas.

In paragraph 14, the Examiner has rejected claims 8 to 10 under 35 U.S.C. 103(a) as being unpatentable over ten Brink in view of Stein and further in view of Thomas. Claims 8 to 10 depend on claim 7. The arguments presented earlier pertaining to claim 7 apply to these claims as well. Therefore, Applicant submits that claims 8 to 10 patentably distinguish over the combination of references.

On this basis it is considered that the Examiner has erred in rejecting claims 8 to 10 under 35 U.S.C. 103(a).

6. Whether claims 40 and 41 are anticipated under 35 U.S.C. 102(e) by Thomas.

Controlling case law has frequently addressed rejections under 35 U.S.C. § 102. "For a prior art reference to anticipate in terms of 35 U.S.C. Section 102, **every element** of the claimed invention **must** be **identically** shown in a single reference." Diversitech Corp. v. Century Steps, Inc., 850 F.2d 675, 677, 7 U.S.P.Q.2d 1315, 1317 (Fed. Cir. 1988; emphasis added). The disclosed elements must be arranged as in the claim under review. See Lindemann Machinefabrik v. American Hoist & Derrick Co., 730 F.2d 1452, 1458, 221 U.S.P.Q. 481, 485 (Fed. Cir. 1984). If any claim, element, or step is absent from the reference that is being relied upon, there is **no** anticipation. Kloster Speedsteel AB v. Crucible, Inc., 793 F.2d 1565, 230 U.S.P.Q. 81 (Fed. Cir. 1986; emphasis added). The following analysis of the present rejections is respectfully offered with guidance from the foregoing controlling case law decisions.

In paragraph 15 of the Final Office Action the Examiner has maintained his rejection of claims 40 and 41 as being anticipated by Thomas. In the Final Office Action the Examiner did not respond to Applicant's arguments presented in the Office Action response filed August 23, 2006. The Examiner has referred to paragraph [0091] of Thomas, but with all due respect, Applicant submits that this simply has nothing to do whatsoever with the subject matter of claim 40 or 41.

In the Office Action of May 24, 2006, the Examiner made the following equivalences with regard to claim 40:

a pilot = redundancy bits added to block signal constellation; and

transmission parameter = input bits.

With all due respect, while the Examiner is entitled to give claim limitations a broad interpretation, this should not be taken to give terms meanings other than their clear meaning. A "pilot" is well known in OFDM to be a transmitted symbol that usually contains known information that is used by the receiver to perform channel estimation. The redundancy bits referred to by the Examiner have nothing to do with channel estimation or pilots. As for the equating of transmit parameter signalling (TPS) with "input bits", TPS is defined in the specification on page 6 to be symbols that are "used to provide comment signalling channels to allow fast physical and media access control layer adaptation signalling". The Examiner has not referred to anything of this sort in the reference.

The Examiner refers to paragraphs [0091] and [0092] as discussing the use of pilots for channel estimates. but with all due respect these paragraphs have nothing to do with pilots or performing channel estimation.

On this basis it is considered that the Examiner has erred in rejecting claims 40 and 41 under 35 U.S.C. 102(e).

7. Whether in claim 37, the expression "the combined pilot symbols" in lines 2 to 3 has insufficient antecedent basis and whether the word "pilot" needs to be inserted after the expression "based on the scattered" in line 2.

In the response to the Final Office Action filed January 16, 2007 Applicant had deleted the term "combined" to address this issue. In addition, the word "pilot" had been included after the expression "based on the scattered" as suggested by the Examiner. Applicant submits that these amendments are sufficient to address the claim objection and 35 U.S.C. 112 rejection raised against claim 37 and further submits that the amendments should be entered.

Response to the Advisory Action

In the Advisory Action dated February 12, 2007 the Examiner disagrees with Applicant's argument that the combination of ten Brink, Stein and Balachandran fails to teach all the limitations of the claimed subject matter of claims 1 and 11, and disagrees with Applicant's argument that there is no motivation to combine these references. In particular, the Examiner submits that the combination of references discloses an apparatus adapted to feed the channel quality back to a transmitter for use in determining and applying appropriate coding rate and modulation. Applicant submits it was the motivation for combining this feature, which is alleged to be taught by Balachandran, with the other references, which was specifically being argued, as none of the other references disclose producing a channel quality indicator to be fedback to the transmitter for use in determining and applying an appropriate coding rate and modulation to the source data element sequence.

Applicant submits that for the reasons expanded upon in the Argument section above, the combination of references does not teach all the limitations of the claimed invention, in the manner claimed. It is not sufficient to simply pick and choose elements from references at random with out a proper motivation to combine them.

The Examiner also submits that "a proper relevancy exists in ten Brink for combining the limitations in the art of Stein as highlighted in the previous office action". However, Applicant submits that the Examiner did not comment on the relevancy of combining Balachandran with ten Brink and Stein, which was argued in the Office Action response filed on January 16, 2007 and reiterated above. Even if a "proper relevancy" exists in ten Brink for combining the limitations in the art of Stein, (which Applicant does not concede), there must also be a "proper relevancy" to combine ten Brink and Stein with Balachandran to establish a *prima facie* case of

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obviousness. For at least the reasons described above, Applicant submits no such "proper relevancy" or motivation exists.

Conclusions

With respect to each of the issues presented herein for review, Applicant respectfully submits that errors have been made in the rejection of the appealed claims.

Regarding the issue of whether claims 1 and 11 are unpatentable under 35 U.S.C. 103(a) over ten Brink (US Patent 6,611,513) in view of Stein (USP 6,175,590) and further in view of Balachandran (USP 6,215,827), Applicant respectfully requests that the rejection of these claims be reconsidered by the Board and withdrawn.

Regarding the issue of whether claims 2, 3, 12 and 13 are unpatentable under 35 U.S.C. 103(a) over ten Brink in view of Stein and in view of Balachandran and further in view of Jones (USP 6,215,813), Applicant respectfully requests that the rejection of these claims be reconsidered by the Board and withdrawn.

Regarding the issue of whether claims 4, 7, 14 and 36 are unpatentable under 35 U.S.C. 103(a) over ten Brink in view of Stein, Applicant respectfully requests that the rejection of these claims be reconsidered by the Board and withdrawn.

Regarding the issue of whether claims 5, 6, 15 and 16 are unpatentable under 35 U.S.C. 103(a) over ten Brink in view of Stein and further in view of Jones, Applicant respectfully requests that the rejection of these claims be reconsidered by the Board and withdrawn.

Regarding the issue of whether claims 8-10 are unpatentable under 35 U.S.C. 103(a) over ten Brink in view of Stein and further in view of Thomas (United States Patent Publication No. 2002/0051498), Applicant respectfully requests that the rejection of these claims be reconsidered by the Board and withdrawn.

Regarding the issue of whether claims 40 and 41 are anticipated under 35 U.S.C. 102(e) by Thomas, Applicant respectfully requests that the rejection of these claims be reconsidered by the Board and withdrawn.

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Regarding the issue of whether in claim 37, the expression "the combined pilot symbols" in lines 2 to 3 has insufficient antecedent basis and whether the word "pilot" needs to be inserted after the expression "based on the scattered" in line 2, Applicant respectfully requests that amendments for claim 37 submitted on January 16, 2007 be entered and considered by the Board.

Respectfully submitted,

MING JIA

By ______________________
Allan Brett
Reg. No. 40,476

Date: July 11, 2007

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Claims Appendix

1. (Previously presented) A channel quality measurement apparatus adapted to measure a quality of a channel over which has been transmitted a sequence of symbols produced by encoding and constellation mapping a source data element sequence, the apparatus comprising:

a symbol de-mapper, receiving as input a sequence of received symbols over the channel whose quality is to be measured, said symbol de-mapper being adapted to perform symbol de-mapping on said sequence of received symbols to produce a sequence of soft data element decisions;

a soft decoder, receiving as input the sequence of soft data element decisions produced by the symbol de-mapper, said soft decoder being adapted to decode the sequence of soft data element decisions to produce a decoded output sequence;

an encoder, receiving as input the decoded output sequence produced by the soft decoder, said encoder being adapted to re-encode the decoded output sequence with an identical code to a code used in encoding the source data element sequence to produce a re-encoded output sequence;

a correlator, receiving as input the sequence of soft data element decisions produced by the symbol de-mapper, and the re-encoded output sequence produced by the encoder, said correlator being adapted to produce a channel quality indicator output by determining a correlation between the sequence of soft data element decisions and the re-encoded output sequence;

wherein the apparatus is adapted to feed the channel quality indicator back to a transmitter for use in determining and applying an appropriate coding rate and modulation to the source data element sequence.

2. (Original) A channel quality measurement apparatus according to claim 1 wherein the symbol de-mapper is adapted to perform QPSK symbol de-mapping.

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3. (Original) A channel quality measurement apparatus according to claim 1 wherein the symbol de-mapper is adapted to perform Euclidean distance conditional LLR symbol de-mapping.

4. (Previously presented) A method of measuring channel quality of a channel over which has been transmitted a sequence of symbols produced by encoding and constellation mapping a source data element sequence, the method comprising:

receiving a sequence of received symbols over the channel whose quality is to be measured;

symbol de-mapping said sequence of received symbols to produce a sequence of soft data element decisions;

decoding said sequence of soft data element decisions to produce a decoded output sequence;

re-encoding said decoded output sequence to produce a re-encoded output sequence using a code identical to a code used in encoding the source data element sequence; and

correlating said re-encoded output sequence, and said sequence of soft data element decisions to produce a channel quality indicator output.

5. (Original) A method of channel quality measurement according to claim 4 wherein the symbol de-mapping of said sequence of received symbols is QPSK symbol de-mapping.

6. (Original) A method of channel quality measurement according to claim 4 wherein the symbol de-mapping of said sequence of received symbols comprises Euclidean distance conditional LLR de-mapping.

7. (Previously presented) A method of measuring OFDM channel quality of an OFDM channel over which has been transmitted a sequence of OFDM symbols, the OFDM symbols containing an encoded and constellation mapped source data element sequence, the method comprising:

receiving a sequence of OFDM symbols over the OFDM channel whose quality is to be measured;

symbol de-mapping said sequence of received symbols to produce a sequence of soft data element decisions;

decoding said sequence of soft data element decisions to produce a decoded output sequence pertaining to the source data element sequence;

re-encoding said decoded output sequence to produce a re-encoded output sequence using a code identical to a code used in encoding the source data element sequence; and

correlating said re-encoded output sequence, and said sequence of soft data element decisions to produce a channel quality indicator output.

8. (Original) A method of OFDM channel quality measurement according to claim 7 wherein the symbol de-mapping of said sequence of received symbols is QPSK symbol de-mapping.

9. (Original) A method of OFDM channel quality measurement according to claim 7 wherein the symbol de-mapping of said sequence of received symbols comprises Euclidean distance conditional LLR de-mapping.

10. (Original) A method of OFDM channel quality measurement according to claim 7 wherein the decoding of said sequence of soft data element decisions to produce a decoded output sequence further comprises using a history of the soft data element decisions, and using information about encoding of the sequence of symbols transmitted over the channel.

11. (Previously Presented) A communication system comprising:

a transmitter adapted to transmit a sequence of symbols produced by encoding and constellation mapping a source data element sequence over a channel; and

a receiver comprising:

a) a symbol de-mapper, receiving as input a sequence of received symbols over the channel, said symbol de-mapper being adapted to perform symbol de-mapping on said sequence of received symbols to produce a sequence of soft data element decisions;

b) a soft decoder, receiving as input the sequence of soft data element decisions produced by the symbol de-mapper, said soft decoder being adapted to decode the sequence of soft data element decisions to produce a decoded output sequence;

c) an encoder, receiving as input the decoded output sequence produced by the soft decoder, said encoder being adapted to re-encode the decoded output sequence with an identical code to a code used in encoding the source data element sequence to produce a re-encoded output sequence; and

d) a correlator, receiving as input the sequence of soft data element decisions produced by the symbol de-mapper, and the re-encoded output sequence produced by the encoder, said correlator being adapted to produce a channel quality indicator output by determining a correlation between the sequence of soft data element decisions and the re-encoded output sequence,

wherein the receiver is adapted to feed the channel quality indicator back to the transmitter, and wherein the transmitter is adapted to use said channel quality indicator to determine and apply an appropriate coding rate and modulation to the source data element sequence.

12. (Original) A communication system according to claim 11 wherein the symbol de-mapper is adapted to perform QPSK symbol de-mapping.

13. (Original) A communication system according to claim 11 wherein the symbol de-mapper is adapted to perform Euclidean distance conditional LLR symbol de-mapping.

14. (Original) A method of adaptive modulation and coding comprising:

transmitting over a channel a sequence of symbols produced by encoding and constellation mapping a source data element sequence;

receiving a sequence of received symbols over the channel;

symbol de-mapping said sequence of received symbols to produce a sequence of soft data element decisions;

decoding said sequence of soft data element decisions to produce a decoded output sequence;

re-encoding said decoded output sequence to produce a re-encoded output sequence using a code identical to a code used in encoding the source data element sequence;

correlating said re-encoded output sequence, and said sequence of soft data element decisions to produce a channel quality indicator output;

transmitting the channel quality indicator; and

using said channel quality indicator to determine and apply an appropriate coding rate and modulation to the source data element sequence.

15. (Original) A method of adaptive modulation and coding according to claim 14 wherein the symbol de-mapping of said sequence of received symbols is QPSK symbol de-mapping.

16. (Original) A method of adaptive modulation and coding according to claim 14 wherein the symbol de-mapping of said sequence of received symbols comprises Euclidean distance conditional LLR de-mapping.

17. (Cancelled)

18. (Original) A method comprising:

applying forward error coding to a signalling message to generate a coded fast signalling message;

MPSK mapping the coded signalling message to produce an MPSK mapped coded signalling message;

mapping the MPSK mapped coded signalling message onto a plurality of sub-carriers within an OFDM frame comprising a plurality of OFDM symbols;

encoding symbols of the MPSK mapped coded signalling message using Differential Space-Time Block Coding (D-STBC) in a time direction to generate encoded symbols; and

transmitting the encoded symbols on a plurality of transmit antennas, with the encoded symbols being transmitted at an increased power level relative to other symbols within the OFDM frame as a function of channel conditions.

19. (Original) A method according to claim 18 wherein the encoded symbols are transmitted in a scattered pattern.

20. (Original) A method according to claim 18 wherein transmitting the encoded symbols on a plurality of antennas comprises:

on a selected sub-carrier, each antenna transmitting a respective plurality N of encoded symbols over N consecutive OFDM symbols, where N is the number of antennas used to transmit, for a total of NxN transmitted encoded symbols, the NxN symbols being obtained from D-STBC encoding L symbols of the MPSK mapped coded signalling stream, where L,N determine an STBC code rate.

21. (Original) A method according to claim 20 further comprising:

transmitting a set of pilot sub-carriers in at least one OFDM symbol;

using the pilot sub-carriers as a reference for a first set of D-STBC encoded symbols transmitted during subsequent OFDM symbols.

22. (Original) A method according to claim 21 wherein transmitting a set of pilot sub-carriers in at least one OFDM frame comprises:

transmitting a plurality of pilots on each antenna on a respective disjoint plurality of sub-carriers.

23. (Original) A method according to claim 22 wherein each disjoint plurality of sub-carriers comprises a set of sub-carriers each separated by N-1 sub-carriers, where N is the number of antennas.

24. (Original) A method according to claim 22 wherein pilot sub-carriers are transmitted for a number of consecutive OFDM frames equal to the number of transmit antennas.

25. (Original) A method according to claim 18 wherein the signalling message contains an identification of one or more receivers who are to receive data during a current TPS frame.

26 (Original) An OFDM transmitter adapted to implement a method according to claim 18.

27. (Original) An OFDM transmitter adapted to implement a method according to claim 20.

28. (Previously Presented) A receiving method for an OFDM receiver comprising:

receiving on at least one antenna an OFDM signal containing received D-STBC coded MPSK mapped coded signalling message symbols;

recovering received signalling message symbols from the OFDM signal(s);

determining from the signalling message symbols whether a current OFDM transmission contains data to be recovered by the receiver;

upon determining the current OFDM transmission contains data to be recovered by the receiver:

a) re-encoding, MPSK mapping and D-STBC coding the received coded signalling message symbols to produce re-encoded D-STBC coded MPSK mapped coded signalling message symbols;

b) determining a channel estimate by comparing the received D-STBC coded mapped coded signalling message symbols with the re-encoded D-STBC coded MPSK mapped coded signalling message symbols.

29. (Original) A method according to claim 28 wherein a channel estimate is determined for each location (in time, frequency) in the OFDM signal containing D-STBC coded MPSK mapped coded signalling message symbols, the method further comprising interpolating to get a channel estimate for remaining each location (in time, frequency) in the OFDM signal.

30. (Original) A method according to claim 29 further comprising:

receiving pilot symbols which are not D-STBC encoded which are used as a reference for a first D-STBC block of D-STBC coded MPSK mapped coded signalling message symbols.

31. (Original) A method according to claim 28 further comprising:

extracting the signalling message.

32. (Original) An OFDM receiver adapted to implement the method of claim 28.

33. (Cancelled)

34. (Original) An article of manufacture comprising a computer-readable storage medium, the computer-readable storage medium including instructions for implementing the method of claim 18.

35. (Original) An article of manufacture comprising a computer-readable storage medium, the computer-readable storage medium including instructions for implementing the method of claim 28.

36. (Original) A method of generating pilot symbols from an Orthogonal Frequency Division Multiplexing (OFDM) frame received at an OFDM receiver, the OFDM frame containing an encoded fast signalling message in the form of encoded symbols within the OFDM frame, the method comprising the steps of:

processing the encoded symbols based in a scattered pilot pattern to recover the encoded fast signalling message;

re-encoding the fast signalling message so as to generate pilot symbols in the scattered pattern;

recovering a channel response for the encoded symbols using decision feedback.

37. (Previously presented) The method of claim 36 comprising the further step of applying a fast algorithm to compute a Discrete Fourier Transform based on the scattered pattern to extract the combined pilot symbols and fast signalling message and only preceding to recover channel response if the fast signalling message indicates a current transmission contains content for the OFDM receiver.

38. (Original) The method of claim 35 wherein processing the encoded symbols comprises:

differentially decoding the encoded symbols using Differential Space-Time Block Coding (D-STBC) decoding to recover the encoded fast signalling message;

applying Forward Error Correction decoding to the encoded fast signalling message to recover a fast signalling message;

analyzing the fast signalling message to determine whether it includes a desired user identification;

if the fast signalling message includes the desired user identification, re-encoding the fast signalling message using Forward Error Correction coding to generate the encoded fast signalling message, and re-encoding the encoded fast signalling message using D-STBC.

39. (Cancelled)

40. (Previously presented) A transmitter adapted to combine pilot and transmission parameter signalling on a single overhead channel within an OFDM signal;

wherein a set of transmission parameter signalling symbols are transmitted on the overhead channel with strong encoding such that at a receiver, they can be decoded accurately, re-encoded, and the re-encoded symbols treated as known pilot symbols which can then be used for channel estimation.

41. (Original) A receiver adapted to process the combined single overhead channel produced by the transmitter of claim 40, the receiver being adapted to:

decode a received signal containing the encoded transmission parameter signalling symbols as modified by a channel, re-encode the decoded symbols to produce known pilot symbols, compare received symbols with the known pilot symbols to produce a channel estimate.

Evidence Appendix

None

Related Proceedings Appendix

None